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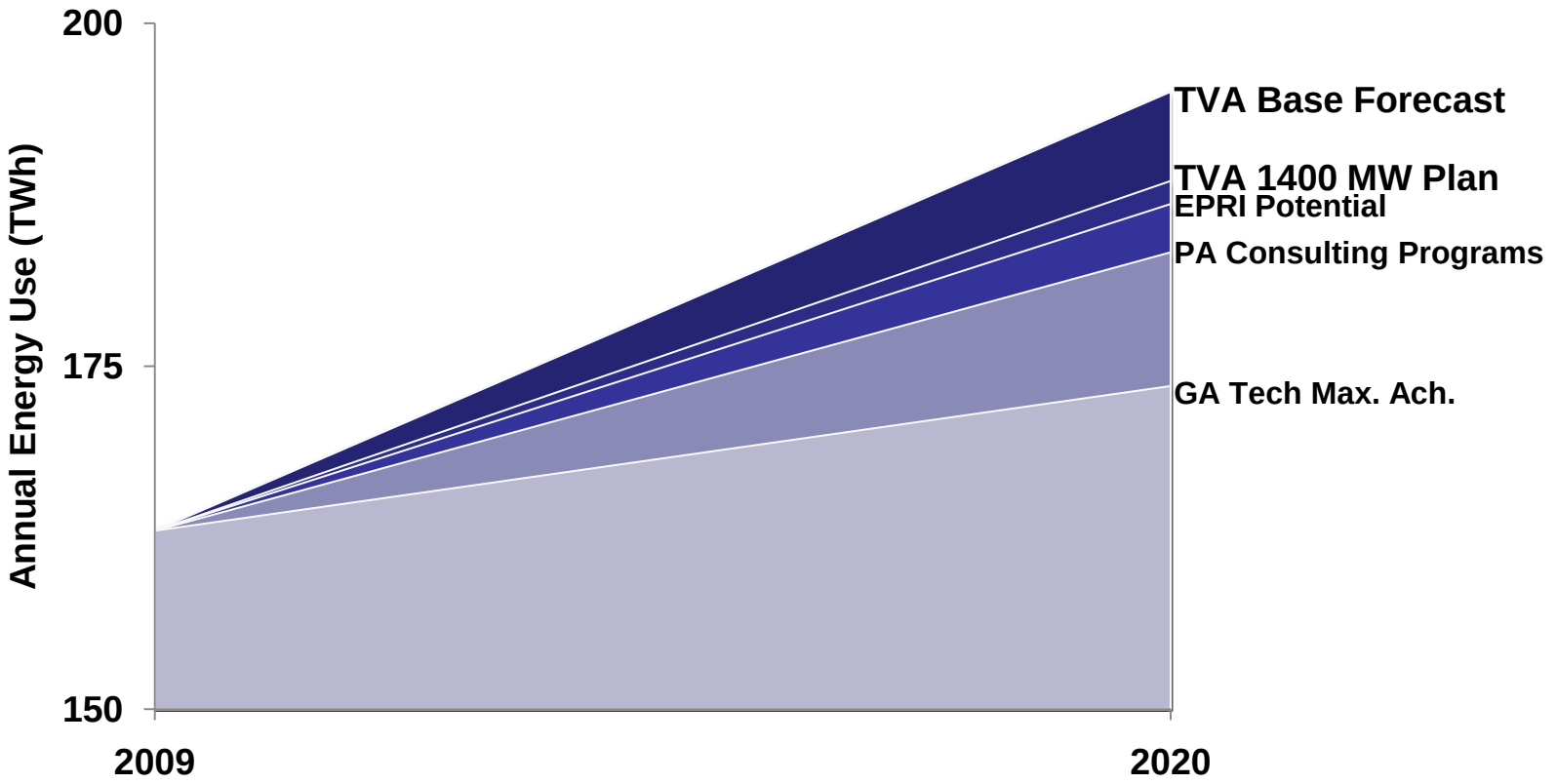
Building the Energy Efficiency Resource for the TVA Region

John D. Wilson, Research Director

December 2009

TVA Should Obtain 10-20 TWh Efficiency in 2020

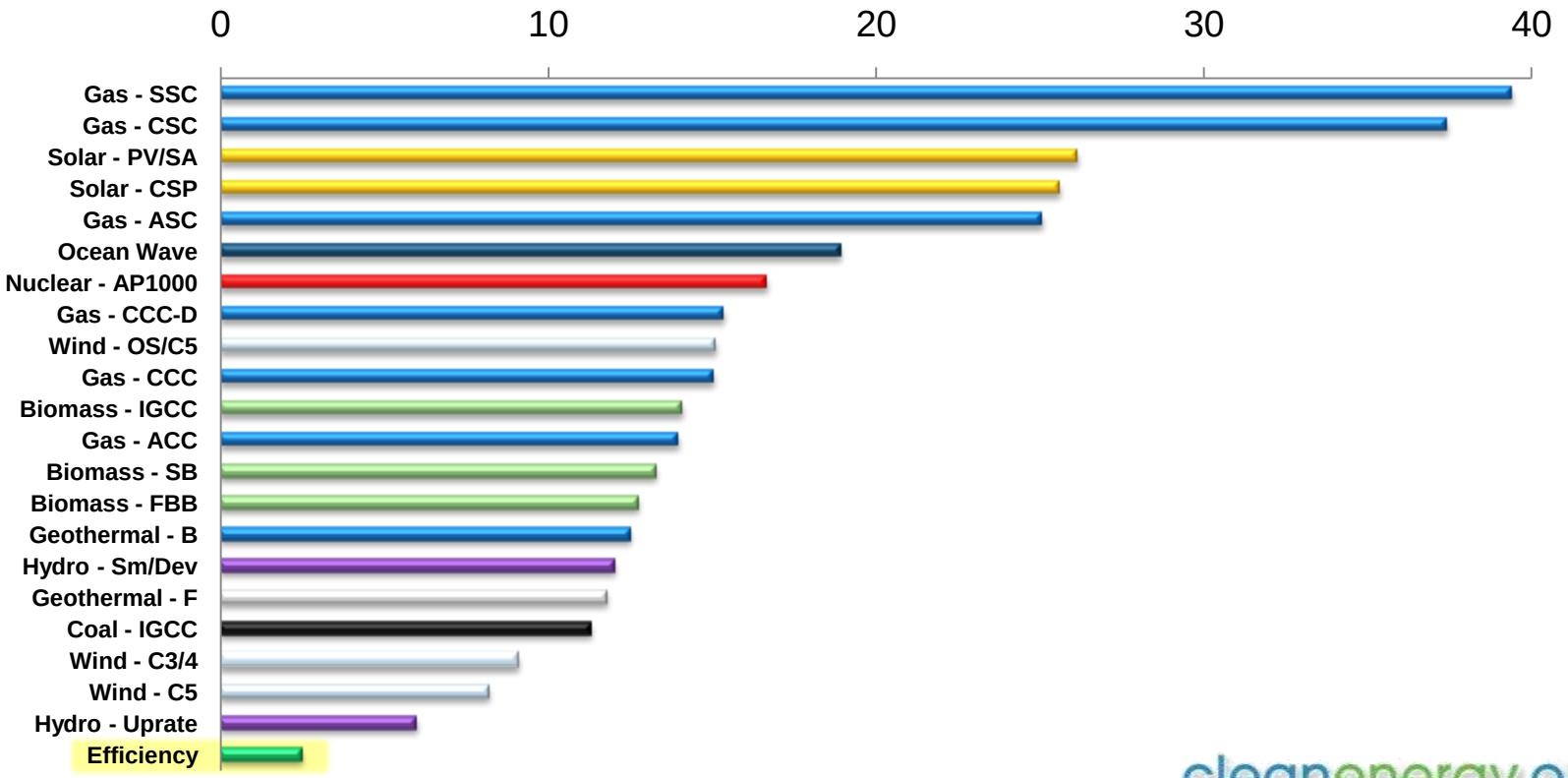


* McKinsey Potential is extrapolated from 2030 potential.

Sources: TVA materials; Chandler, S and M A Brown, *Meta-Review of Efficiency Potential Studies and Their Implications for the South*, Georgia Tech Ivan Allen College School of Public Policy, Working Paper # 51 (August 2009).

Energy Efficiency is the Least-Cost Resource

Average Levelized Cost for Public-Owned Utility
In-Service in 2018 (c/kWh)



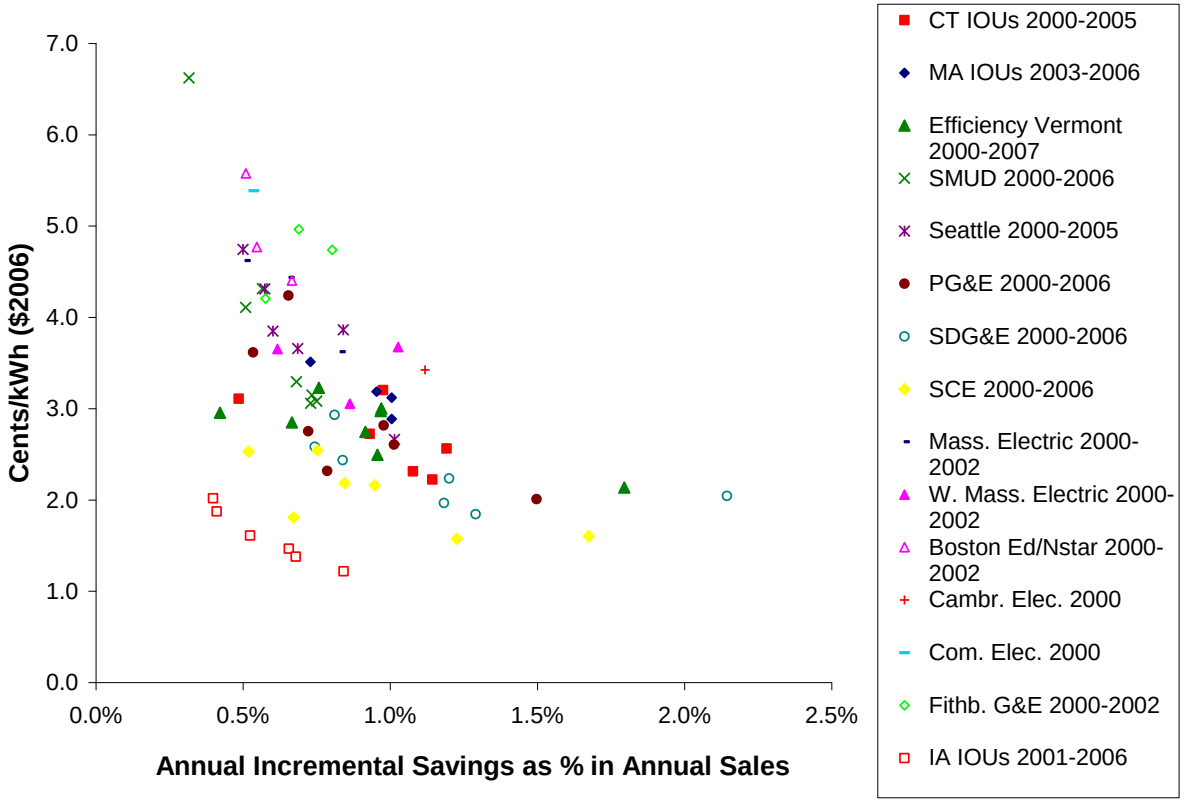
Source: California Energy Commission, *Comparative Costs of California Central Station Electricity Generation*, CEC-200-2009-017-SD, Draft Staff Report, August 2009.
American Council for an Energy-Efficient Economy, *Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved Through Utility-Sector Energy Efficiency Programs*, Report U092, September 2009.

Economy of Scale: Costs Go Down As Market Penetration Increases

Economy of scale is a given in many businesses, and energy efficiency is no exception. Synapse Energy Economics collected data from fifteen leading energy efficiency programs across the country.

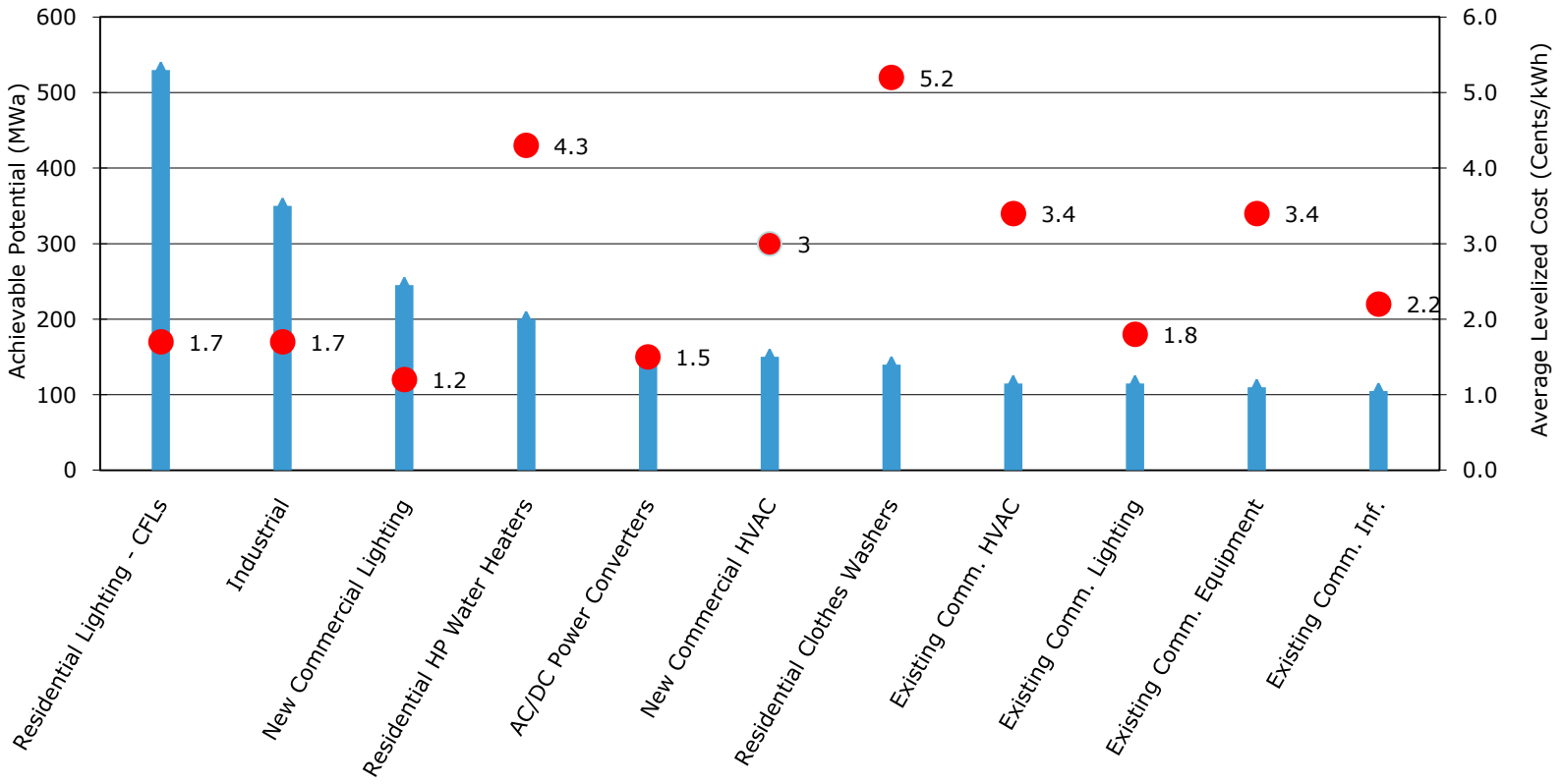
For every utility studied, the cost per kWh of energy efficiency programs was lower at higher levels of impact.

This suggests that utilities that "dabble" in energy efficiency with pilot programs and the like will find higher costs relative to utilities that make a strong and sustained commitment to building a mature program.



Takahashi, K and D Nichols, *The Sustainability and Costs of Increasing Efficiency Impacts: Evidence from Experience to Date*, 2008 ACEEE Summer Conference, August 2008.

Costs, Potential Vary by Measure



Source: *Northwest Power and Conservation Council,* Fifth Northwest Power Plan.

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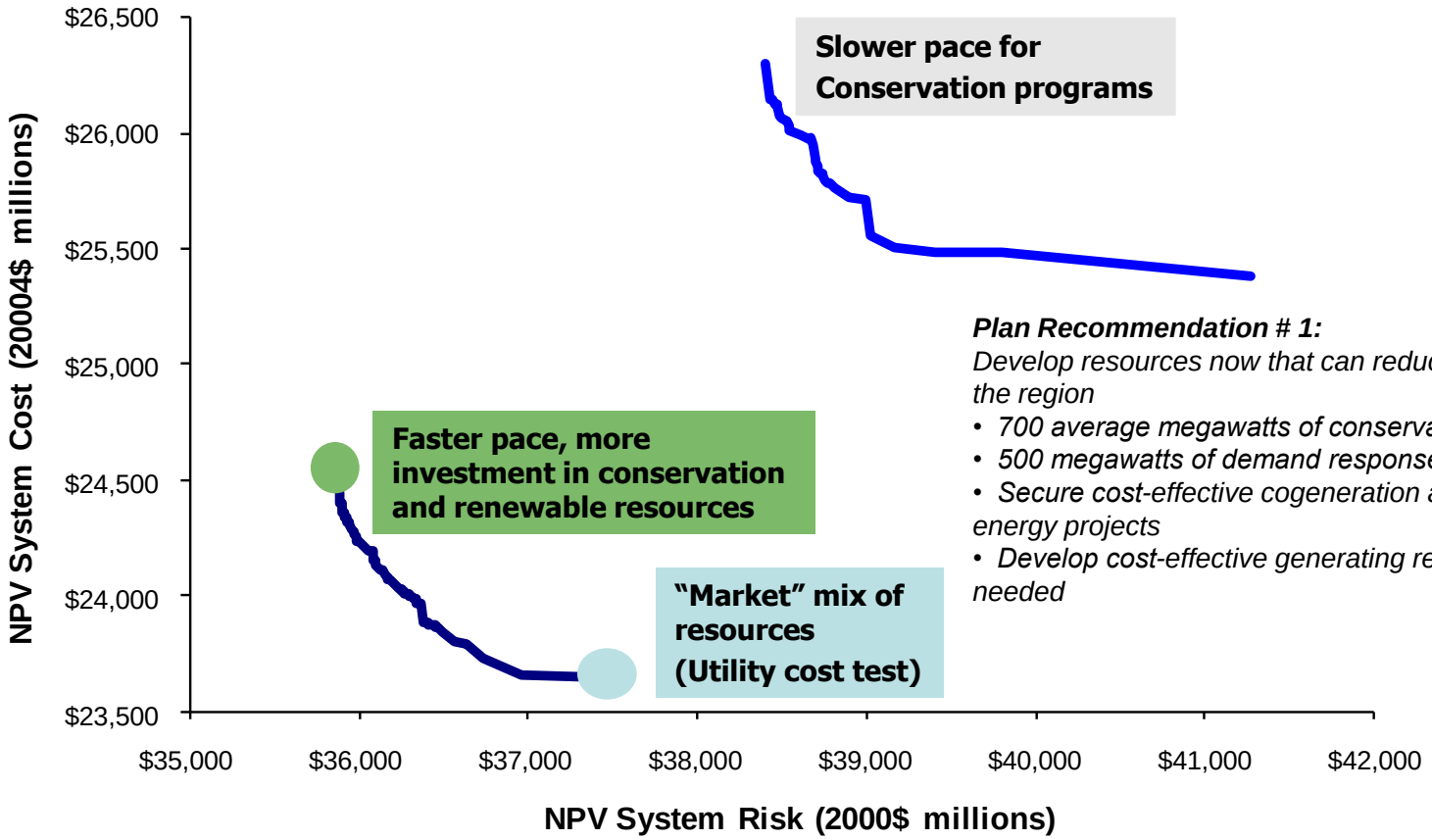
EE Reduces Cost *and* Risk



Plan Recommendation # 1:
Develop resources now that can reduce cost and risk to the region

- *700 average megawatts of conservation, 2005 - 2009*
- *500 megawatts of demand response, 2005 - 2009*
- *Secure cost-effective cogeneration and renewable energy projects*
- *Develop cost-effective generating resources when needed*

Source: The Fifth Northwest Electric Power and Conservation Plan, 2005

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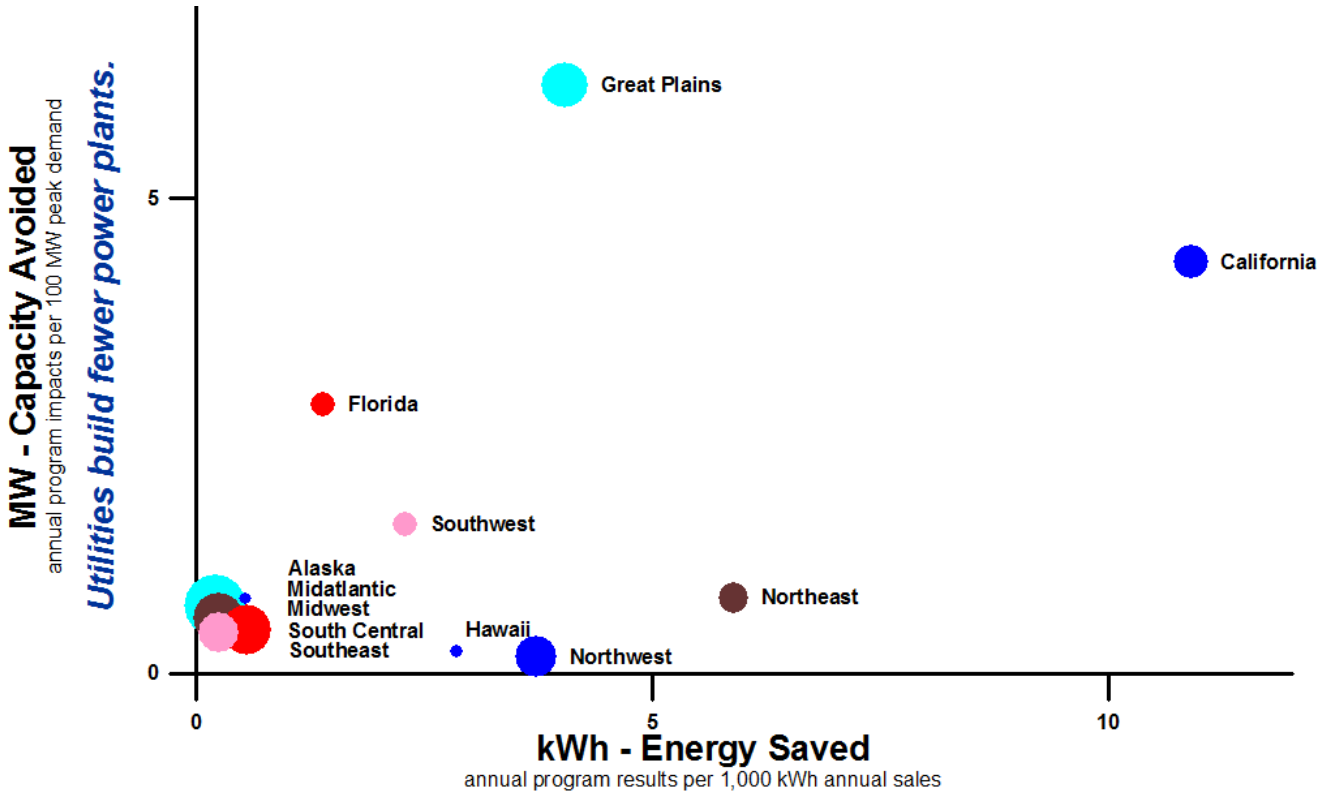
Efficiency Value: Capacity and Energy Savings



Customers buy less electricity, cause less global warming pollution.

Source: SACE analysis of Energy Information Administration data (2005-2006)

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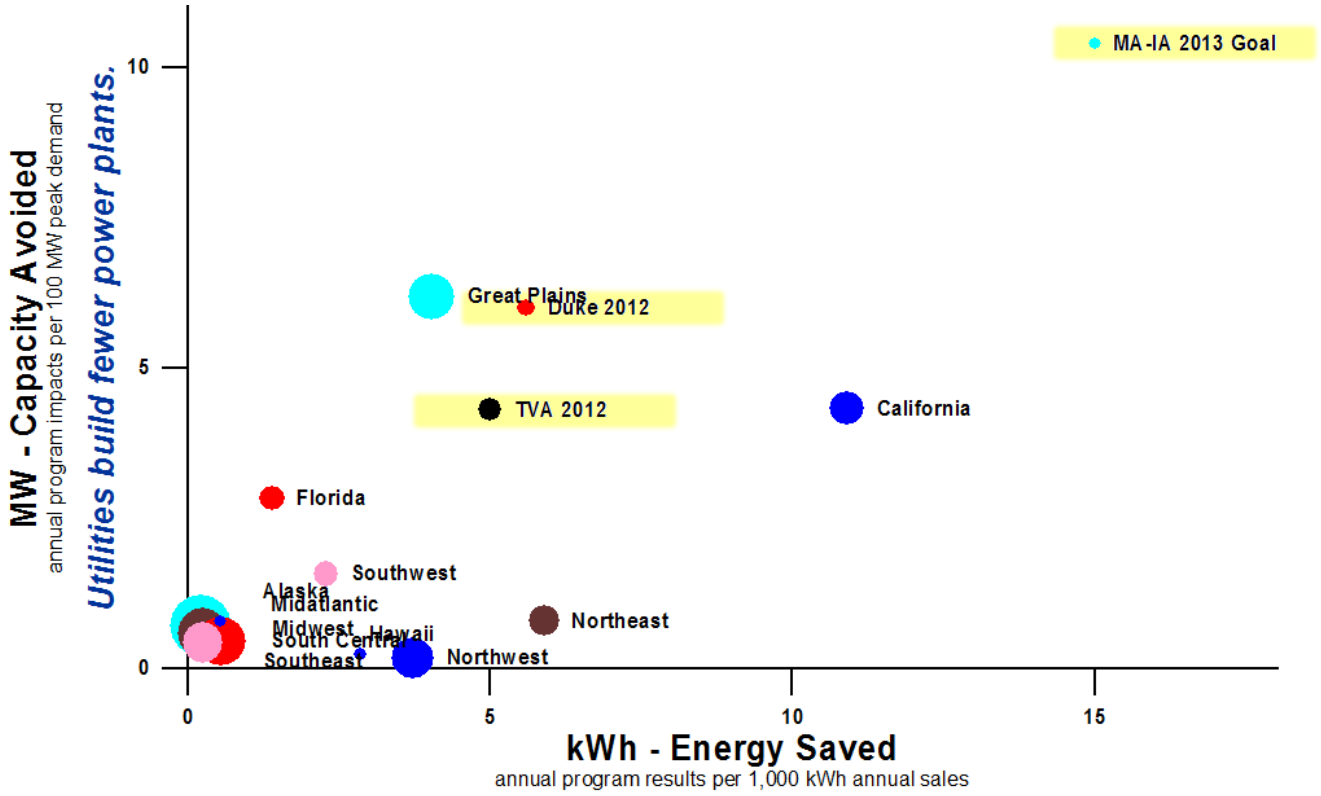
New Commitments in Southeast



Customers buy less electricity, cause less global warming pollution.

Source: SACE analysis of Energy Information Administration data (2005-2006).
TVA: Colston presentation; Duke: 2009 IRP; MA-IA: MidAmerican 2008 EE Plan for Iowa.

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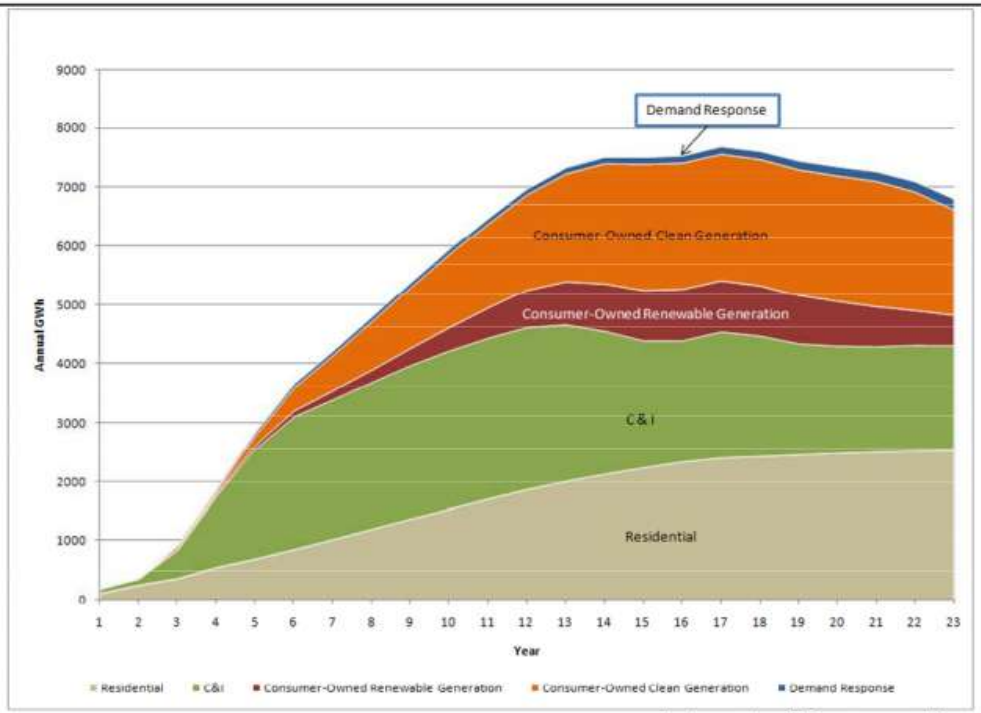
Will They Grow?

TVA Portfolio Potential Energy Savings (GWh)



Integrated Resource Plan

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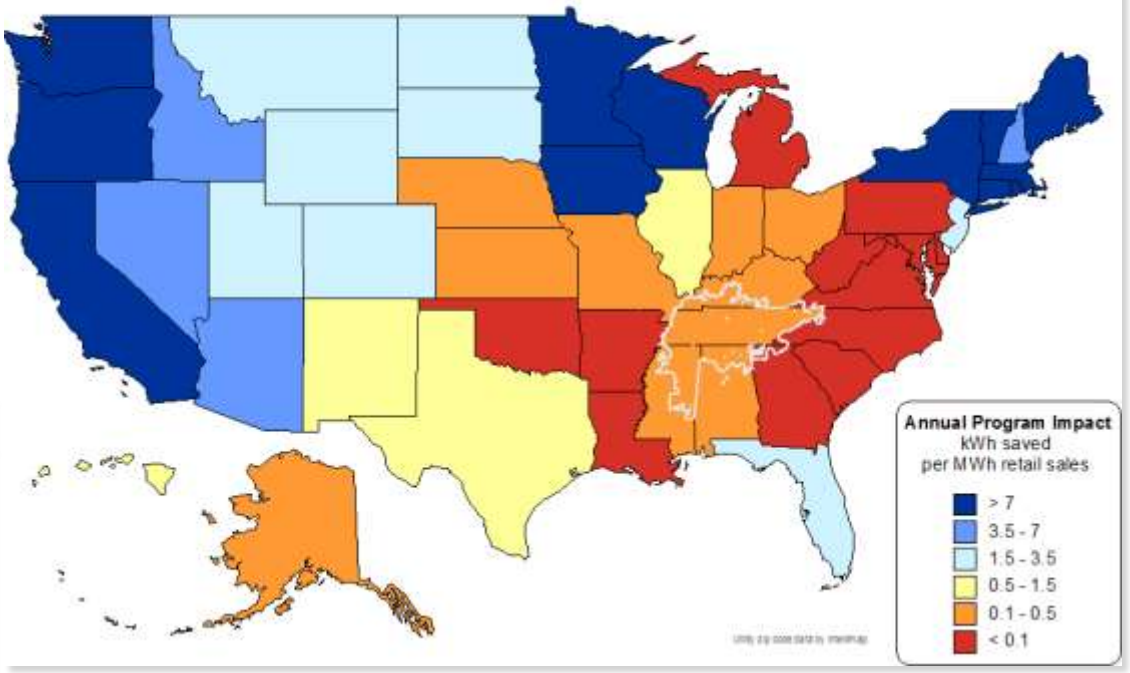
Southeast Lags the Nation: Energy Efficiency Program Impacts

Florida is the only Southeast state with energy efficiency programs operating at a significant level of statewide impact. Leading states in other regions of the country are saving as much as 100 times more energy than most states in the Southeast.

North Carolina has joined most states outside the Southeast in adopting state policy favoring energy efficiency. The region from South Carolina to Louisiana is the largest block of states that continue to discourage efficiency.

State	2007 Impact
Alabama	0.2
Florida	1.5
Georgia	0.0
Mississippi	0.2
North Carolina	0.0
South Carolina	0.0
Tennessee	0.2
Virginia	0.0

2007 Energy Efficiency Program Impacts, by State



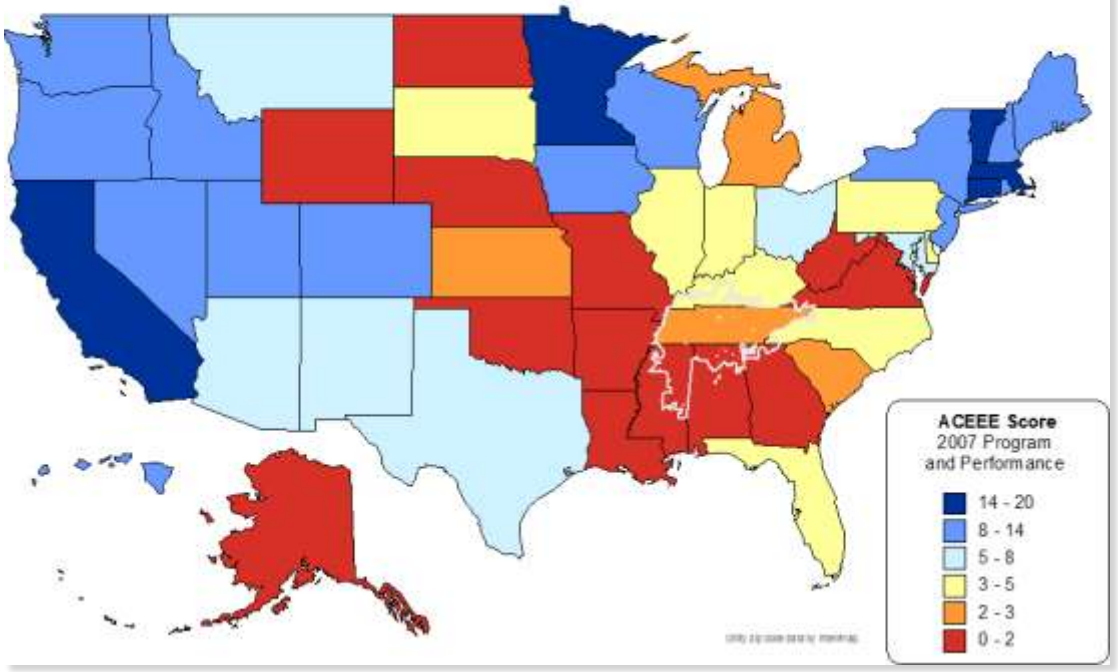
Source: ACEEE, EIA Form 861. Sources and assumptions explained in *Energy Efficiency Program Impacts and Policies in the Southeast* (May 2009).

Southeast Lags the Nation: ACEEE Energy Efficiency Program Score

ACEEE issues an annual scorecard ranking states on a range of efficiency-related program and policy achievements. One component of the score is "Utility and Public Benefits Programs and Policies."

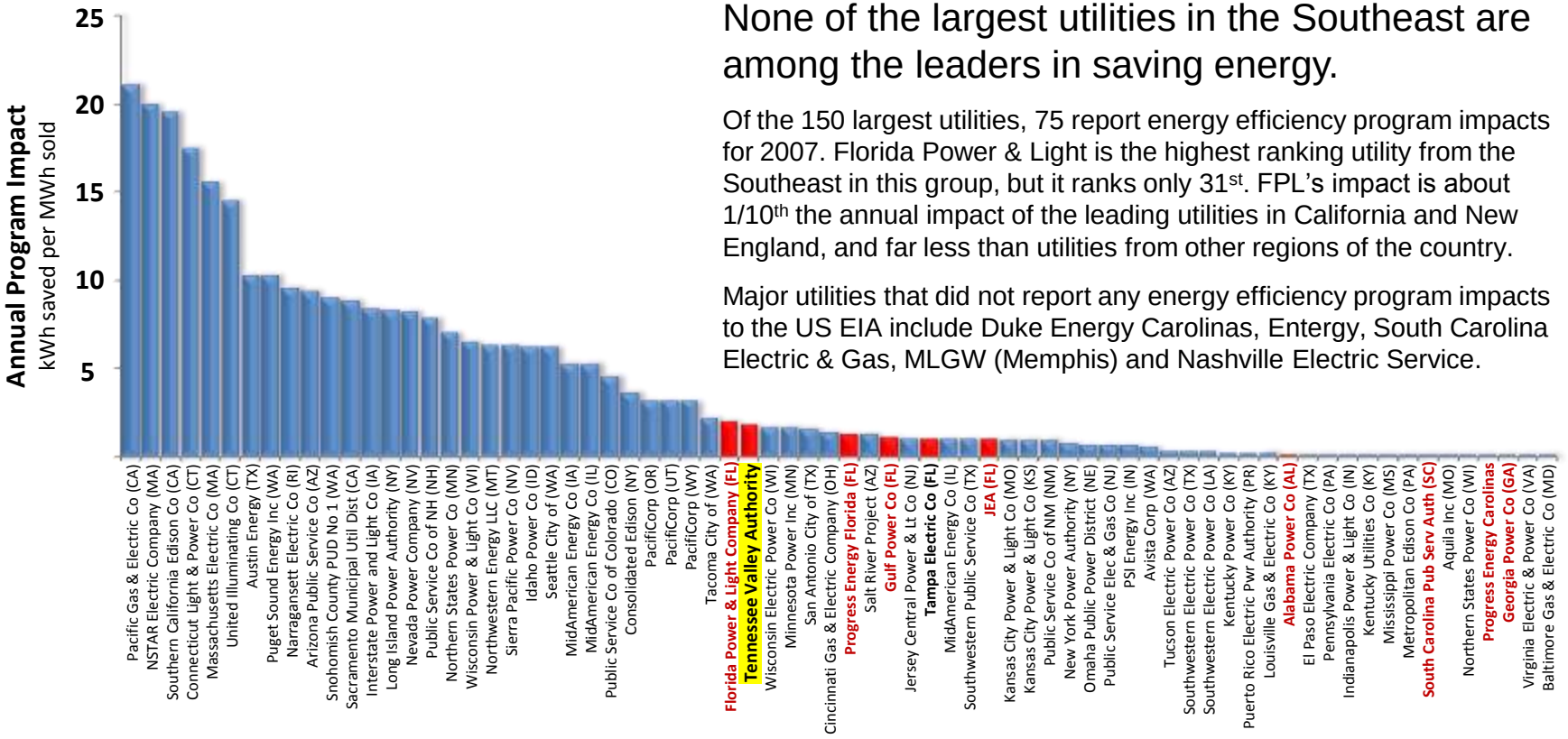
Similar to the 2007 program impact data analysis, the Southeast generally lags the nation in efficiency programs. However, this analysis presents a slightly more nuanced picture of Southeast states than the simple 2007 program impact data.

ACEEE Score for Utility and Public Benefits Programs and Policies



Source: ACEEE, *2009 State Energy Efficiency Scorecard,* Report E097 (May 2009).

None of the Largest Southeast Utilities Lead on Energy Efficiency



None of the largest utilities in the Southeast are among the leaders in saving energy.

Of the 150 largest utilities, 75 report energy efficiency program impacts for 2007. Florida Power & Light is the highest ranking utility from the Southeast in this group, but it ranks only 31st. FPL's impact is about 1/10th the annual impact of the leading utilities in California and New England, and far less than utilities from other regions of the country.

Major utilities that did not report any energy efficiency program impacts to the US EIA include Duke Energy Carolinas, Entergy, South Carolina Electric & Gas, MLGW (Memphis) and Nashville Electric Service.

Source: EIA Form 861.
Note: TVA performance based on direct service data only; the TVA system (including direct serve and distribution utilities) has substantially lower annual program impact.

Why Does the Southeast Lag Other Regions in Energy Efficiency?

- **Myths:**
  - Energy efficiency is too expensive, unreliable
  - Low electric rates make efficiency infeasible
  - Low-income people are an obstacle*
- **Reality: The Southeast lacks . . .**
  - legislative standards similar to those adopted in many states
  - utility regulatory commission support
  - high quality programs, with economies of scale to achieve low costs
  - interest of utility management
  - rate structures that promote efficiency
  - financial incentives for utility success (utilities face disincentives)

* "These low-income households are truly unable to participate in any energy efficiency and conservation efforts." – *Testimony of South Carolina Public Service Commissioner David A. Wright before the Senate Energy and Natural Resources Committee on a national Renewable Portfolio Standard,* February 10, 2009.

Cost is Not the Barrier

- **Florida energy savings potential = 9.8% of sales**
- **About 80% of these savings are so cost-effective that they have a customer payback of less than two years at current Florida electric rates**

Source: Florida Public Service Commission, Staff Recommendation, FEECA Proceedings. October 15, 2009.

Cost is Not the Barrier

Duke Energy Carolinas Save-a-Watt Program Bill Analysis

Hearing Exhibit_____

Example Bill Impact for Participating Customers

	Avg Monthly Usage (kWh)	Reduction in Usage (kWh/mo)	Adjusted Usage (kWh)	Approx. Monthly Savings	Approx. Annual Savings	
Home Energy House Call with Kit	1,000	81	919	$6.71	$80.51	
6 CFLs	1,000	32	968	$2.66	$31.87	
Smart $aver Central A/C	1,000	70	930	$5.82	$69.89	
				$15.19	$182.27	**Gross Customer Benefit**
				$1.74	$20.83	Approximate Rider Expense
				$13.45	$161.44	**Net Benefit to Customer After Rider**

NOTES: Assumes residential tail block rate = $0.083/kWh
Assumes energy efficiency rider = $0.001736/kWh
Assumes typical residential customer uses (on average) 1,000 kWh per month

Raiford Smith, Duke Energy Carolinas, Docket 2009-226-E, December 2, 2009

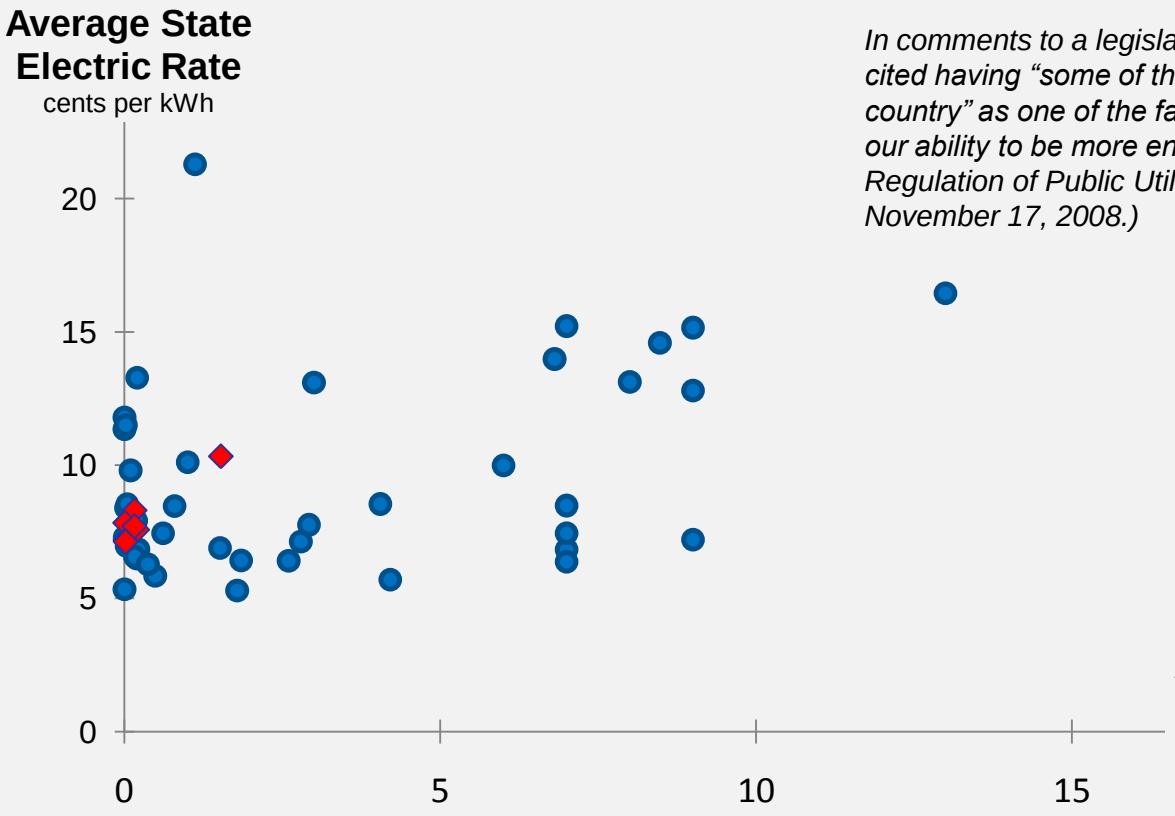
Utility Scale is Not the Barrier

Xcel Energy Utilities	2008 Actual Savings	2012 Forecast Savings
Southwestern Public Service (NM/TX)	0.2%	1%
Northern States Power (MN/ND/SD)	0.9%	1.1%
Colorado Public Service	0.5%	0.7%
Northern States Power (WI/MI)	0.8%	?
Total Annual Program Energy Savings	0.7%	> 0.9%

NYSERDA New York State Energy Research and Development Authority

NYSERDA is another good model of a large scale efficiency program. It operates statewide efficiency programs that complement the programs offered by specific utilities within the state.

Rates Are Not the Barrier



In comments to a legislative study committee, SCE&G cited having "some of the lowest electricity prices in the country" as one of the factors that "prohibit or inhibit our ability to be more energy efficient." (State Regulation of Public Utilities Review Committee, November 17, 2008.)

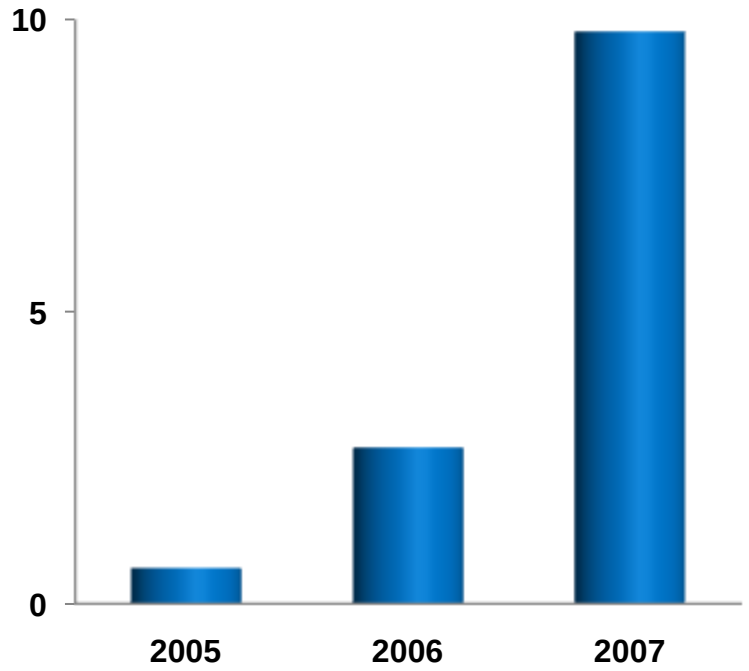
◆ **Southeast States**

Source: ACEEE, EIA Form 861 (see Sources and Assumptions).

Southeast Success Story: Reedy Creek Improvement District

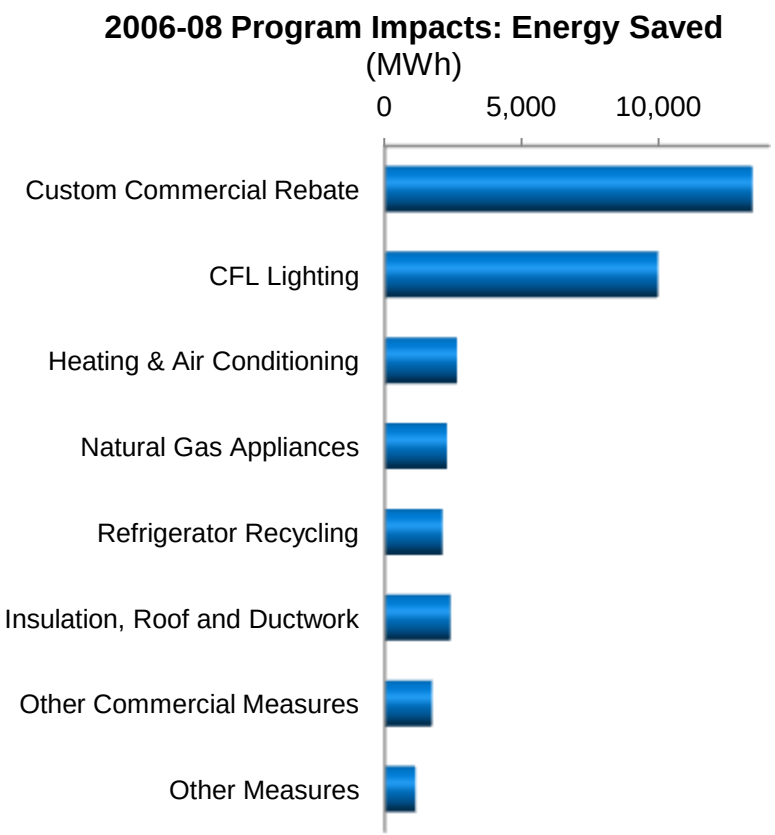
- **Reedy Creek Improvement District provides energy & energy services to Walt Disney World** (Orlando, FL)
- **From 1996 to 2006, Disney saved**
  - 100 GWh of electricity
  - 1 million therms of natural gas
- **Disney reports a 53% internal rate of return for efficiency programs**
- **Impacts increased dramatically in 2007**
- **Disney's program:**
  - Energy management system for each facility
  - Energy information system provides data to energy managers and other stakeholders
  - Disney staff collectively participate

Reedy Creek Efficiency Programs Impact
kWh saved per MWh retail sales



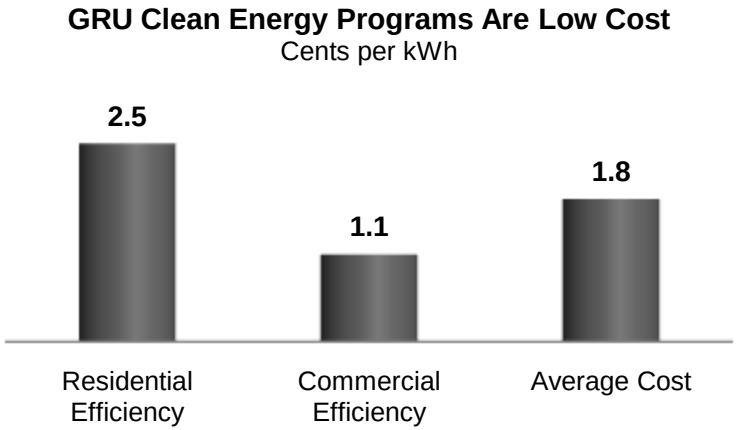
Source: EIA Form 861. Allen, P J, *Walt Disney World Resort's Energy Management Program*, 2006.

Southeast Success Story: Gainesville Regional Utilities



Gainesville Regional Utilities (GRU) is among the nation's leaders in energy efficiency. Its 2007 programs had an impact of approximately 7.6 kWh energy savings per MWh electricity sales.

In 2006, Gainesville Regional Utilities revised its energy strategy to put greater emphasis on energy efficiency and renewable energy. Since that time, its energy efficiency program impact has more than tripled – with very high cost-effectiveness.



Source: Gainesville Regional Utilities, Fourth Quarter FY08 Report of Energy Efficiency Programs.
Note: Average cost also includes a small amount of renewable energy at about 20 cents per kWh.

If it's so cheap, why . . .?

- **Lack of information, awareness**
- **Lack of capital**
- **Utility financial regulation – disincentive to utility support**
- **Utility planning policy – energy efficiency not equal to supply resources**
- **Efficiency programs not up to date**
- **Transaction costs**
- **"Split-incentive" or "Principal-Agent" problem**

National Action Plan for Energy Efficiency (July 2006)

Efficiency Barrier Example: "Principal-Agent" Problem

- **One party (the agent) makes decisions affecting end-use energy efficiency**
- **A different party (the principal) bears the consequences of those decisions**
  - Builders affect homebuyers
  - Owners affect tenants (commercial & residential)
  - One department makes decisions, another pays bills
- **"some 50% of total US residential energy usage is subject to the PA barrier"**

Prindle, Bill, *Quantifying the Effects of Market Failures in the End-Use of Energy*, ACEEE for International Energy Agency (February 2007).
Murtishaw, Scott and Jayant Sathaye, *Quantifying the Effect of the Principal-Agent Problem on US Residential Energy Use*, Lawrence Berkeley National Laboratory, Report LBNL-59773 (August 2006).

Building Efficiency Into a Resource Plan

- **Goals based on "all cost-effective energy efficiency"**
  - Widely used approach, although some states are using legislative goals which are less flexible
- **Efficiency is first in loading order**
  - Used widely in the West
- **Efficiency as a market resource**
  - Primarily in deregulated Northeast
- **Third Party Administrator**
  - Budget drives scale of effort, utilities respond

Prioritizing Efficiency: California

- **CA: Energy Action Plan: "cost effective energy efficiency is the resource of first choice for meeting California's energy needs. Energy efficiency is the least cost, most reliable, and most environmentally-sensitive resource, and minimizes our contribution to climate change.**
  - Legislative mandate to "include a showing that the electrical corporation will first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible. (SB 1037, 2005).
  - Implementation takes the form of long-term EE goals for state utilities drawing from achievable potential studies supported by strong M&V and administrative structures.

Prioritizing Energy Efficiency: Pacific Northwest

- **Northwest Power and Conservation Council**
  "The Council's analysis shows that improved EE costs less than construction of new generation and provides a hedge against market, fuel, and environmental risks. To achieve these benefits fully, however, stable and sustained investment in conservation is necessary."
  - Federal mandate imbedded in enabling statute to "give priority to resources which the Council determines to be cost effective. Priority shall be given: first, to conservation; second, to renewable resources, third, to generating resources utilizing waste heat or generating resources of high-fuel conversion efficiency, and fourth, to all other resources." (Pacific NW Electric Power Planning and Conservation Act, 1980)
  - The Council's *Draft Sixth Northwest Power Plan:* Envisions that "58% of the new demand for electricity over the next five years could be met with EE. Over the entire 20-year horizon of the power plan (through 2030), energy efficiency, which is the most cost-effective and least risky resource available, could meet 85% of the Northwest's new demand for power."

Prioritizing Energy Efficiency: Pacificorp

- **Pacificorp: "energy efficiency was handled differently relative to past IRPs. Rather than treating [EE] as a decrement to the load forecast, Pacificorp modeled [EE] as a resource option to be selected as part of a cost-effective portfolio resource mix. . ."**

Prioritizing Energy Efficiency: MidAmerica

- **MidAmerica (Iowa): Investor-owned utilities conduct energy efficiency programs under plans which are reviewed and approved by the IUB. "Key features of all plans and programs approved for IOUs include:**
  - Plans must be cost-effective, with four benefit-cost tests used to determine cost-effectiveness from the perspective of the participating customers, the utility, the combination of the utility and customers, and the impacts on rates.
  - Plans must include programs for all types of customers.
  - Plans must include an analysis of potential for energy efficiency, and must include performance standards in terms of energy and capacity savings."
- **Key results of analysis of progress to date (2007):**
  - Benefits: IOUs/customers get back $2 for every $1 invested; NET societal benefits of more than $200 million per year
  - Benefits: Dollars spent on energy efficient equipment and saved by customers tend to remain in Iowa.

Is TVA "RDEE" to Go?

"These programs have become part of the nation's field-tested energy efficiency delivery infrastructure."

NAPEE Rapid Deployment Energy Efficiency Program	TVA
Energy Star Products	
Tier 1 Residential Energy Audit and Direct Installation	Pilot in-home evaluation
Home Performance with ENERGY STAR	
Residential Efficient Heating and Cooling	Heat pump incentives
Non-Residential Prescriptive Rebates	C&I Advice & Incentives
Non-Residential Retrocommissioning	Retro/Re-Commissioning (dev't)
Commercial Food Service	
Non-Residential (Commercial & Industrial) Custom Incentives	HVAC & lighting incentives Industrial process improvement
Non-Residential Benchmarking and Performance	
Non-Residential On-Site Energy Manager	
Home Energy Comparison Report (not a RDEE program, but also a "quick start" opportunity)	

Source: National Action Plan for Energy Efficiency, *Rapid Deployment Energy Efficiency (RDEE) Toolkit: Planning & Implementation Guides,* Draft, October 6, 2009.

The Rapid Deployment Energy Efficiency (RDEE) Toolkit

The Toolkit "is being provided to help recipients of ARRA funding meet these objectives and challenges. The Toolkit provides information on ten program types across the residential, commercial, and industrial sectors, drawn from the experience of hundreds of federal, state, local, private, and utility organizations. These programs were selected because they work: they have been successful in putting to good use hundreds of millions of dollars in training, support, marketing, administration, and customer incentives. Moreover, these ten program types have improved through years of experience and scrutiny in design and implementation. Over this time, these programs have become part of the nation's field-tested energy efficiency delivery infrastructure."

National Action Plan for Energy Efficiency, *Rapid Deployment Energy Efficiency (RDEE) Toolkit: Planning & Implementation Guides*, Draft, October 6, 2009.

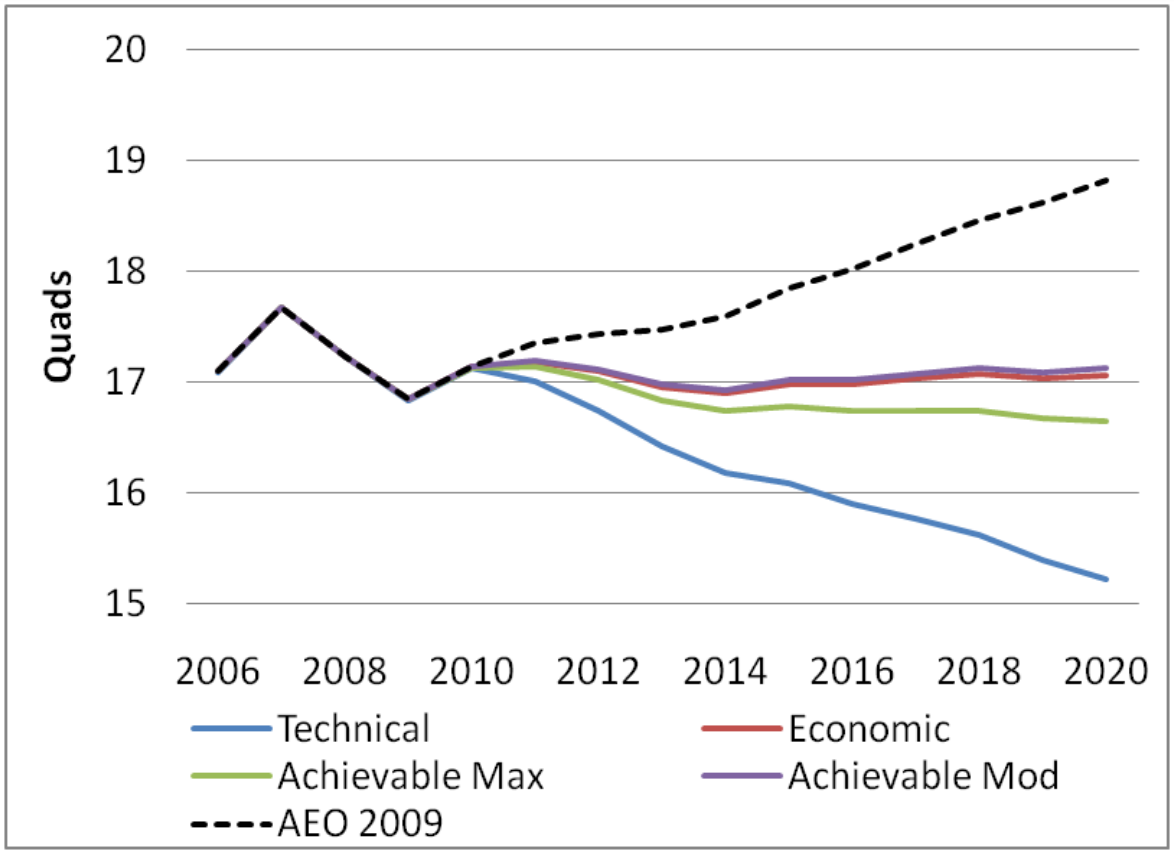
Xcel Program Offerings

- **Commercial and Industrial**
  - Boiler Efficiency
  - Business New Construction
  - Commercial Real Estate
  - Compressed Air
  - Cooling Efficiency
  - Custom Efficiency
  - Data Center Efficiency
  - Efficiency Controls
  - Efficiency Proposal
  - Energy Analysis
  - Heating
  - Lighting
  - Motor and Drive
  - Process Efficiency
  - Recommissioning
  - Refrigeration Recommissioning
  - Vending Efficiency

(note that these vary by state)

- **Residential**
  - ENERGY STAR Homes
  - Home Energy Audits
  - Home Performance with ENERGY STAR
  - Lighting
  - Low Income Energy Savings
  - Time of Day Rate
  - Electric space heating rate surcharge
  - Limited Off-Peak Rate
  - Air Source Heat Pump Rebate
  - Central AC Rebate
  - Ground Source Heat Pump Rebate
  - Heating Rebates
  - Water Heater Rebates
  - Saver's Switch

Efficiency Should Mean Little or No Growth – And Could Mean A Decline in Energy Use



Sources: Chandler, S and M A Brown, *Meta-Review of Efficiency Potential Studies and Their Implications for the South*, Georgia Tech Ivan Allen College School of Public Policy, Working Paper # 51 (August 2009).

How fast?

- **Minnkota/NMPA Plan developed in 9 months**
  - 17 Cooperative & Municipal Utilities
  - Increase program scale by 350% in 2 years
  - 10 programs first year
  - 5 programs second year
  - 1.6 cents per kWh

- **ComEd (Illinois) program filed → impact in 8 months**
  - Commercial and industrial "Smart Ideas" program includes both "prescriptive" and "custom" incentives
  - 90 GWh impact from 4 months of applications

Lisa Pickard and Ed Carroll, "17 Cooperative and Municipal Utilities' Approach to Field Aggressive Energy Efficiency Programs Across a Region," Minnkota Power Cooperative and Franklin Energy (September 2009).
Stephan Baab, "Big Savings Fast," ComEd (September 2009).
Emmett Romine, "Your Energy Savings: Program Overview," DTE Energy (September 2009).